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I, LEANNE MYNOTT, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. PQ 2408 for a patent by PETER RAFFAELE and MICHAEL RAFFAELE filed on 24 August 1999.

WITNESS my hand this
Eleventh day of April 2000

LEANNE MYNOTT
TEAM LEADER EXAMINATION
SUPPORT AND SALES



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This invention relates to scotch yoke engines or pumps and more particularly relates to "conventional" opposed piston type scotch yoke devices.

Usually in such devices two opposed pistons are rigidly connected together about a yoke. A slider, which is rotatably mounted on a big end of a crank, slides within
5 the yoke and causes the pistons to reciprocate.

The present invention aims to provide improved yoke constructions, which allows, in preferred forms, for two identical parts to be utilised to build up the yoke assembly. The assembly may be a split generally axially or transversely relative to the cylinder axis. In preferred forms the number of fixing components required
10 is reduced whilst allowing for simple manufacture of the components.

In one broad form the invention provides a yoke assembly for a scotch yoke type fluid device having opposed pistons reciprocating in opposed cylinders having parallel cylinder axes, the yoke assembly attached to the two pistons and including an engagement portion for receiving an engagement member rotatably
15 mounted on a big end of a crank shaft and in which the engagement means reciprocates as the crank rotates, said engagement portion being split into two parts releasably engaged together.

The engagement portion may be split along a plane generally parallel to the cylinder axes or a plane generally perpendicular to the cylinder axes.

20 The two parts may be identical or may be dissimilar.

Preferably only two fixings are required to securely hold the two parts together.

The engagement portion preferably includes two opposed channels in which the engagement means reciprocates. Each of the channels may be defined by only one of the parts or both parts may define part of each channel.

25 Preferably, where identical parts only define all or part of one channel each, each part includes legs which extend and engage the other part. These legs may be located at opposite ends of the channel but on the same lateral side; the same end but opposite lateral sides of the channel or opposite ends and opposite lateral sides of the channel. Preferably, a single fixing may hold two legs, one for
30 each part, simultaneously.

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Where non-identical parts are utilised, one part may have two or more spaced apart legs located adjacent the channel and the other part may have no legs or one leg adjacent the channel.

- Preferably, the legs are located at the ends of the channel but a single leg may be positioned adjacent the channel at a mid-point. In this construction the crank cannot pass through the engagement portion.

Figure 1 shows an end view of a first embodiment of the invention. For clarity some components are omitted.

Figure 2 is a perspective view of the Figure 1 embodiment.

- Figure 3 shows an exploded perspective view of the first embodiment.

Figure 4 shows a perspective view of a second embodiment of the invention.

Figure 5 shows a perspective view of a third embodiment of the invention.

Figure 6 shows an exploded perspective view of the third embodiment.

Figure 7 shows an end view of the third embodiment.

- Figures 8 to 11 show perspective conceptual views of various yoke constructions.

Referring to Figures 1 and 2 there is shown an opposed piston scotch yoke device 10 having a crank 12, cylinders 14 on either side of the crank and two pistons 16 mounted on a scotch yoke assembly 18. The scotch yoke assembly 18 defines a slot 20 in which a slider 22, slides. The slider 22 is rotatably mounted on the big end 24 of the crank. For clarity only half of the crank is shown and in practice the big end would extend through the slider 22.

The yoke assembly includes two identical pieces 26a and 26b. Each piece has a centrally located mounting 28 on which a piston 16 mounts, a transverse section 30 and a longitudinal section 32.

- The transverse section extends generally perpendicular to the cylinder axes whilst the longitudinal section extends generally parallel to the cylinder axes.

A channel 34 extends in the transverse and longitudinal sections in which the slider is located. At the free end 36 of the transverse section are bolt holes 38 whilst at the free end 40 the longitudinal section there are bolt holes 42. The two

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Identical parts are joined with the free ends 36 of the transverse sections engaging the free ends 40 of the longitudinal sections of the other part. The bolt holes 38 and 42 align and the two parts are secured together with the bolts 44 and nuts 46.

- 6 A tubular spacer 48 is positioned within the channel through which the bolts pass to prevent overtightening and crushing of the slot.

As best seen in Figure 2, the longitudinal sections have closed ends 50.

Figures 3 and 4 show a variation of the Figure 1 and 2 device which is functionally identical except that the end 50 of each yoke part is not closed.

- 10 Instead the channel 38 extends through the end. This aids in manufacturing as the channel may be easily ground with a grinding wheel, without the ends of the longitudinal section limiting movement of the grinding wheel. The end 50 of the longitudinal section is not required to maintain the slider in the channel.

- Figures 5 and 6 show a further variation of the yoke assembly. In this
- 15 embodiment the yoke assembly 60 is split along the cylinder axis to form two identical portions 62a, 62b. The portions are U-shaped, having a central body 64 with axially extending arms 66. Each portion is symmetrical about a centre line perpendicular to the cylinder axis.

- The opposing faces of the two pairs of arms 66 are each provided with two stud
- 20 holes 68 and studs 70 are provided to locate the two halves together. The two halves are secured together by bolts 74 which pass through bolt holes 76 at each end of the arms 66 and screw into the opposing arm 66. The ends of the arms 66, when joined, form a receptacle 78 into which the piston is mounted. This receptacle allows the piston to rotate about the cylinder axis.

- 25 The assembly also includes joining members 80. These joining members are located within the channel and have threaded studs 82 which extend through holes 84. The members 80 are secured to the two halves by nuts 86 and serve to resist bending of the two halves of the assembly out of a plane.

Figures 8 to 11 show conceptually components for building up yoke assemblies.

- 30 Figure 8 shows a yoke assembly 90 comprising two non-identical portions 92 and 94. The first portion 92 has a transverse arm 96, a piston mounting portion 98 and a central arm 100. The ends of the transverse arm have bolt holes 102 which

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extend through the arm whilst the free end of the central arm 100 has a single hole 104.

The other portion 94 has a transverse arm 106, piston mounting portion 108 and two arms 110 extending from adjacent the ends of the transverse arm 106. The arms 110 extend from the same side of the central arm and at their free ends have holes 112. The transverse arm 106 has a central bolt hole 114.

When assembled the central arm 100 is attached to transverse arm 106 by a bolt passing through hole 104 into hole 114. Similarly arms 110 are attached to transverse arm 96 by bolts passing through holes 112 into holes 102. The bolt holes 102 and 114 may be threaded or unthreaded. Three bolts are required for assembly.

It will be appreciated that this configuration may only be used where the big end does not pass through the yoke.

Figure 9 shows a variation of the twin arm part of Figure 8. This variation allows two identical components to be joined together. The component 120 has a transverse arm 122, piston mounting 124 and two arms 126 extending from the same side of the transverse arm 122. Bolt holes 128 are provided in the free ends of arms 126 and holes 130 in ends of the arm 122. Two components 120 may be assembled with holes 128 and 130 aligned and secured together by a bolt being screwed into or passing through holes 130. Four bolts are required for assembly.

Figure 10 shows a variation of the Figure 9 embodiment. Figure 10 shows a yoke component 140 having two parts 142 and 144. The first part 142 includes transverse arm 146, piston mounting 148 and a single longitudinal arm 150. The other part 144 corresponds to the arm 150 and is provided with bolt holes 152 and 154 for mounting to the two transverse arms. Whilst this construction has four parts compared to two in the Figure 9 embodiment, the same number of bolts is required - only four.

Figure 11 shows a yoke assembly 160 comprising two identical parts 162. Each part includes a transverse arm 164, a piston mounting 166 and two longitudinal arms 168, 170. In contrast to the Figure 9 or 10 embodiments, in this embodiment the arms 168 and 170 extend from opposite sides of the transverse arm 164. Bolt holes 172 and 174 are provided at the free ends and base of the arms 168, 170 to allow the two components to be joined together.

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It will be appreciated by those skilled in the art that many modifications and variations may be made to the embodiments described herein without departing

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from the spirit or scope of the invention.

Dated this 23rd day of August, 1999

Peter and Michael Raffaele

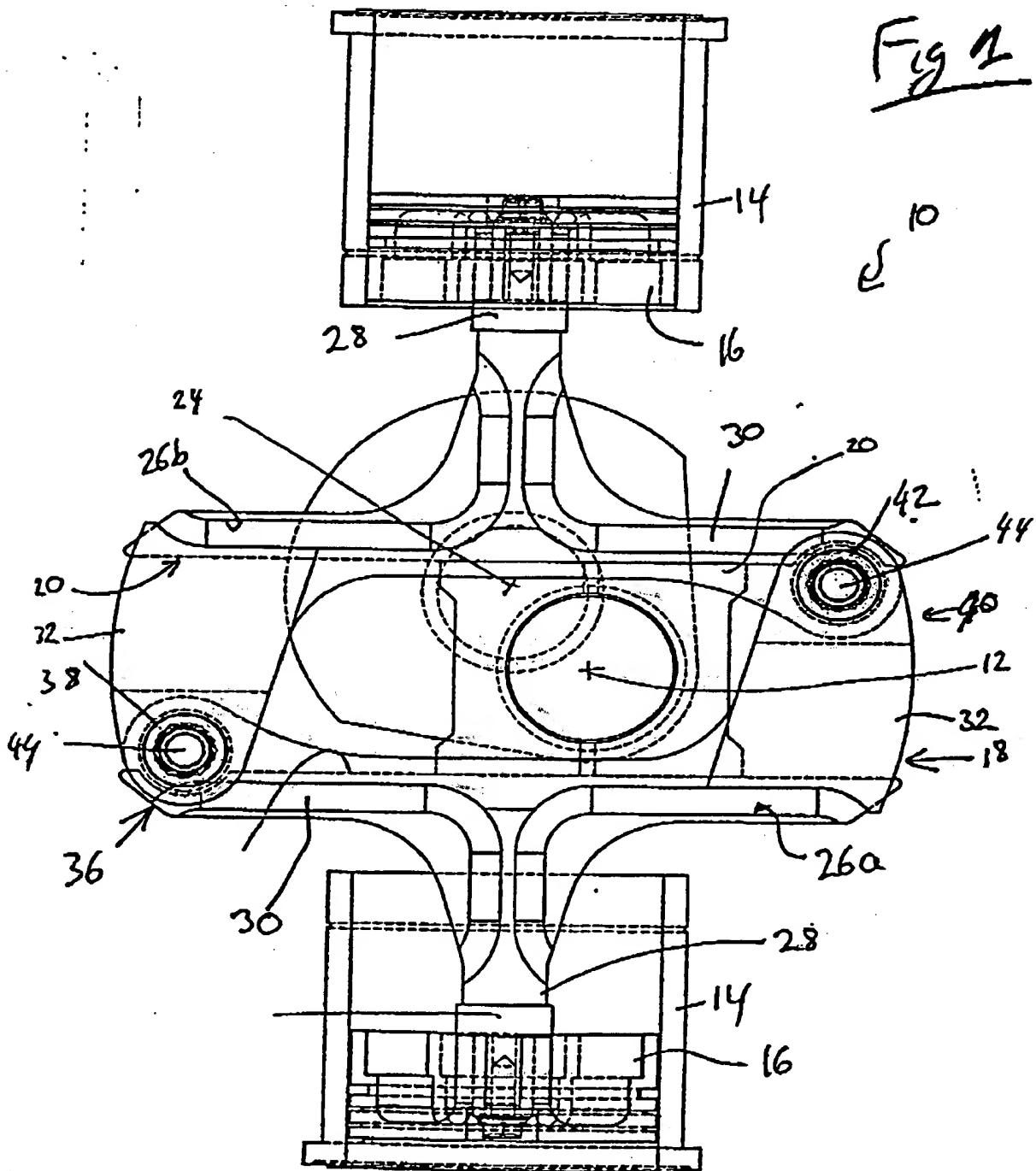


Fig 2

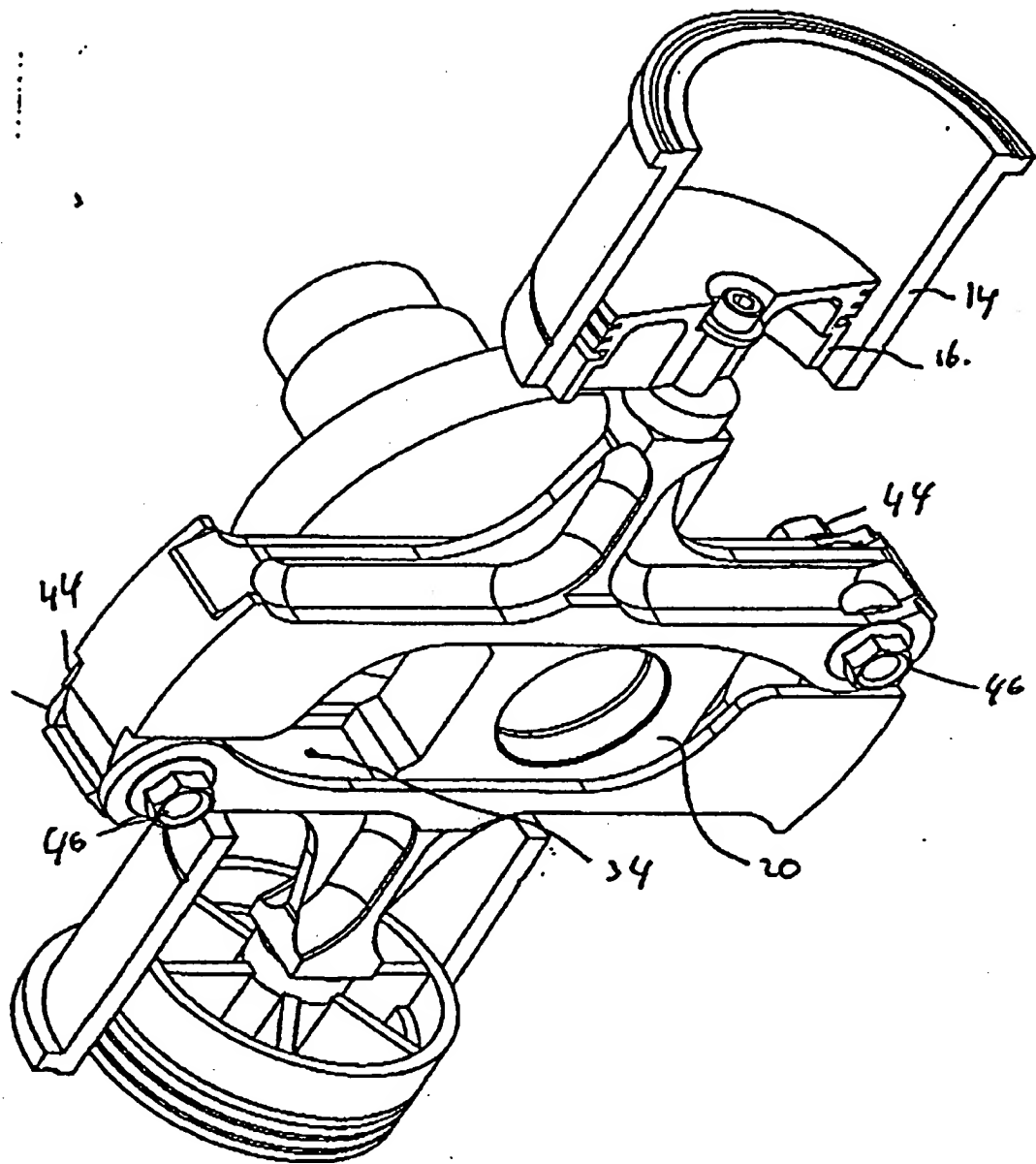


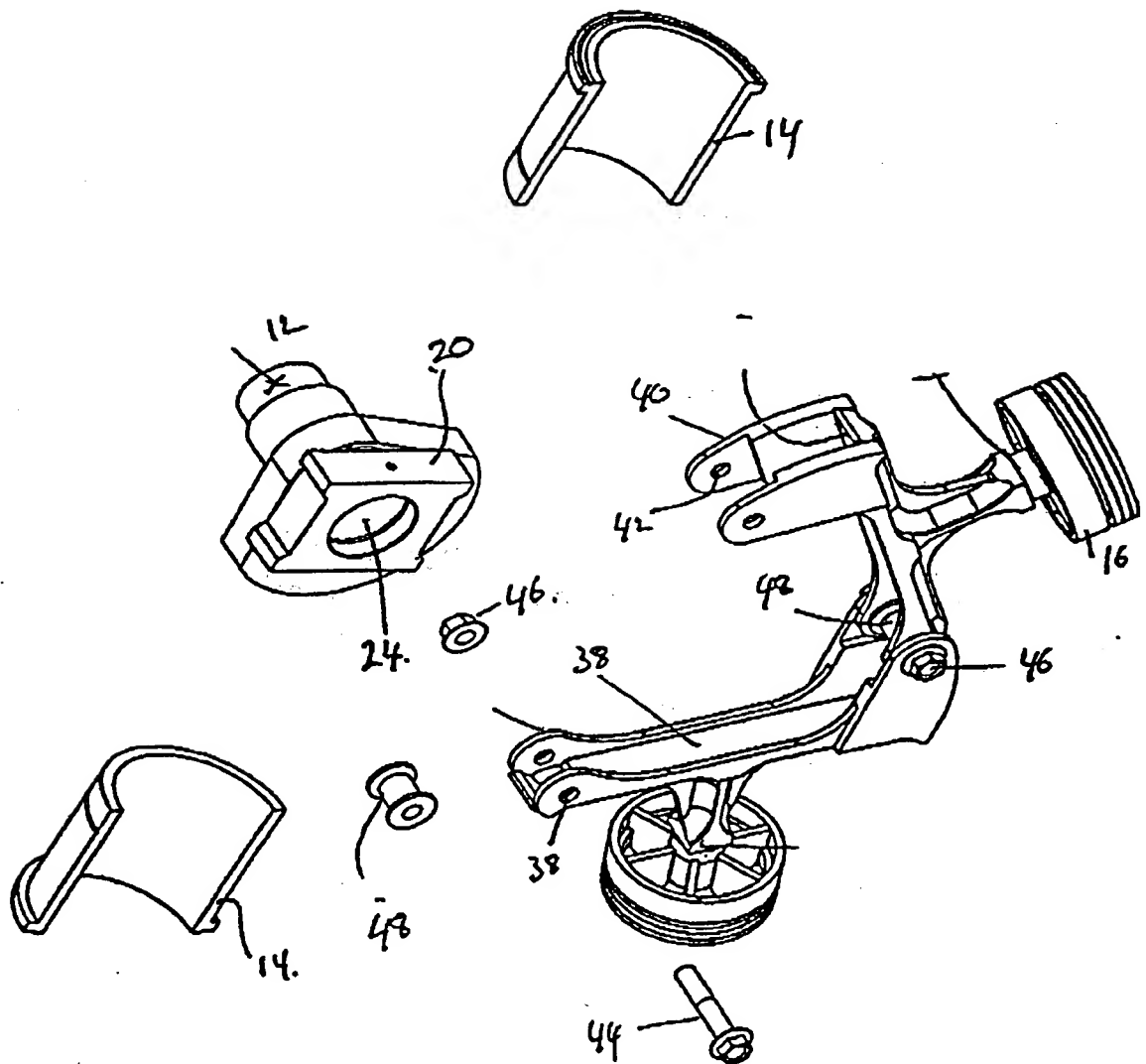
Fig 3

Fig 6

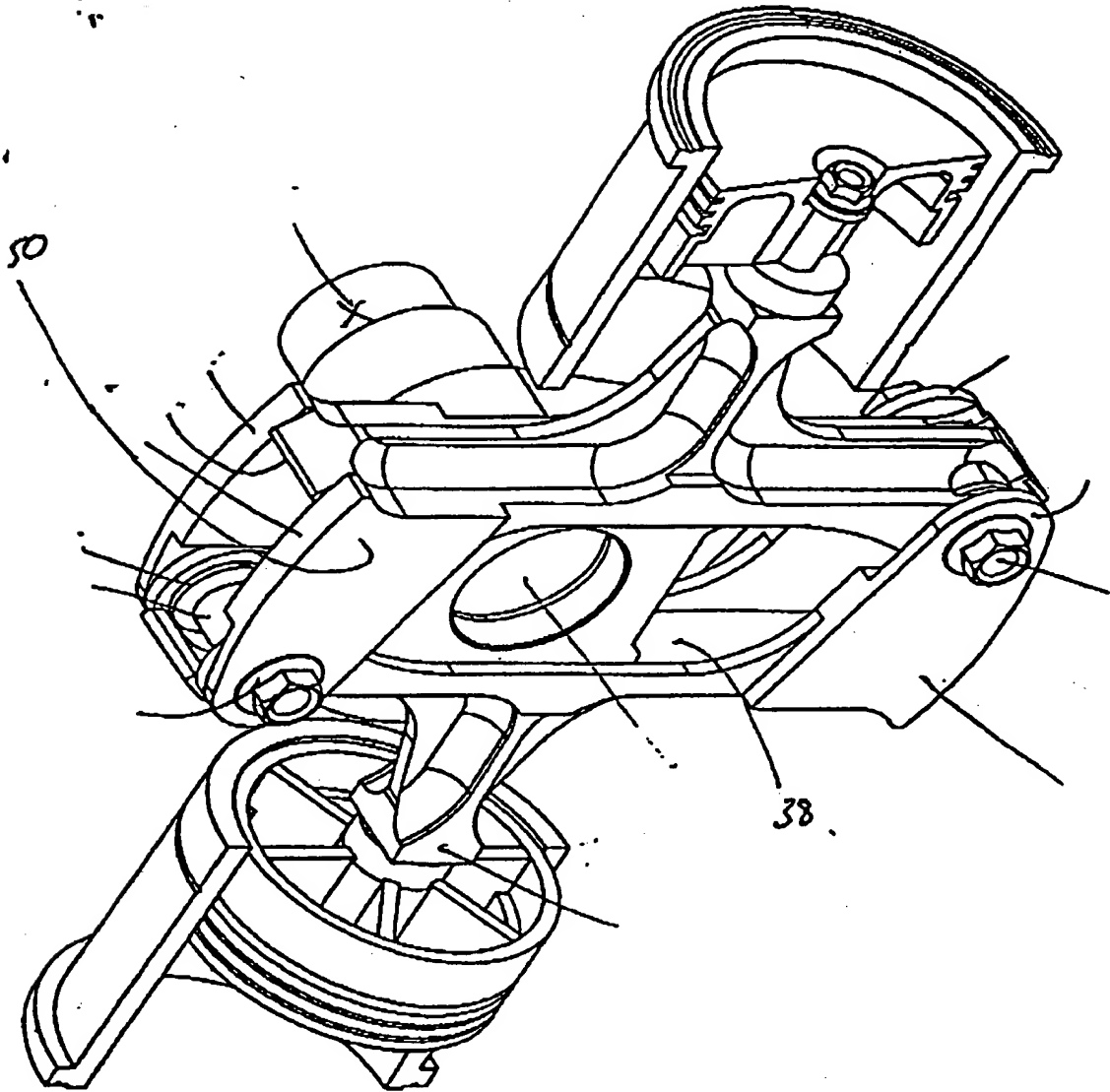


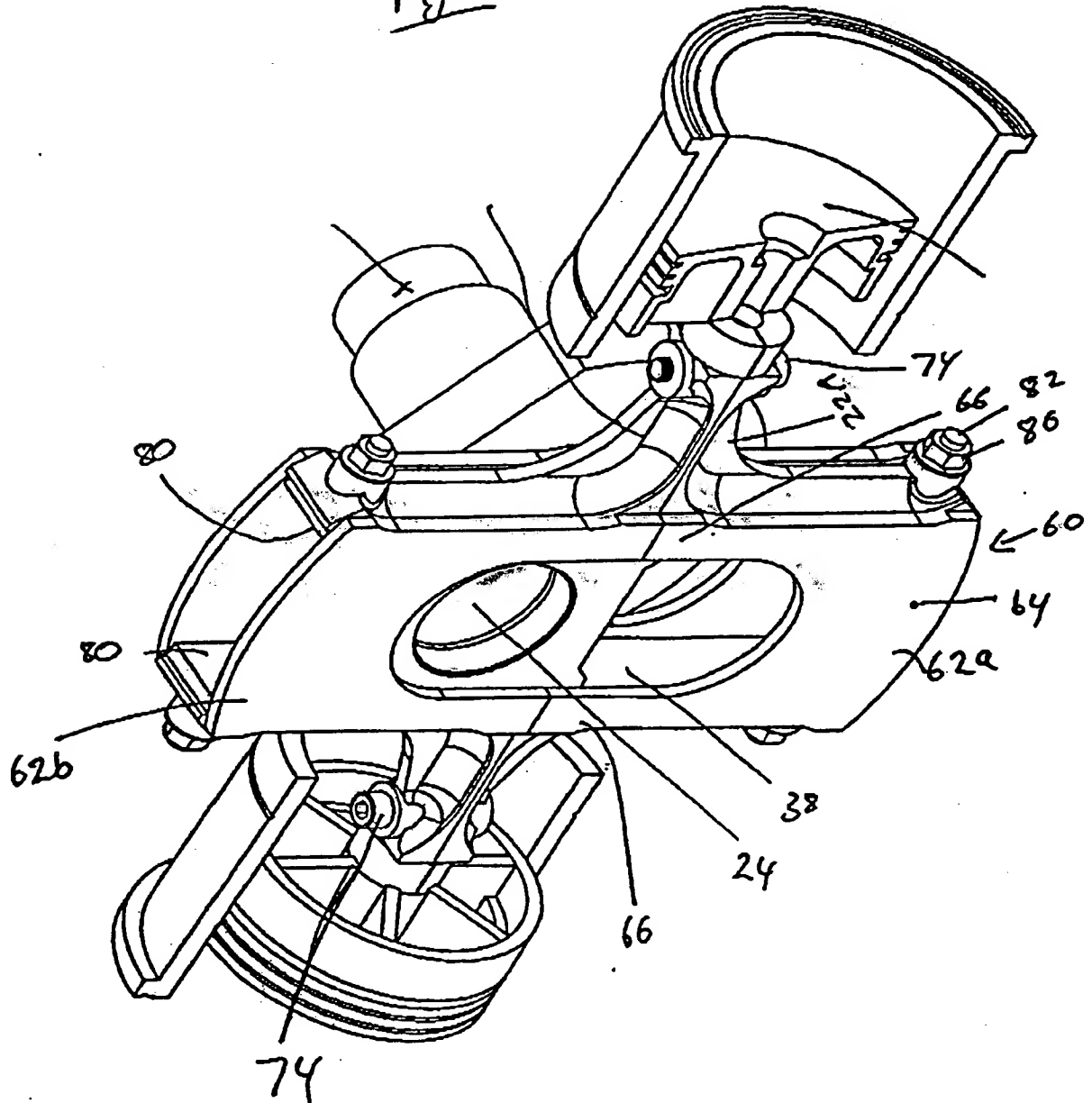
Fig 5

Figure 6.

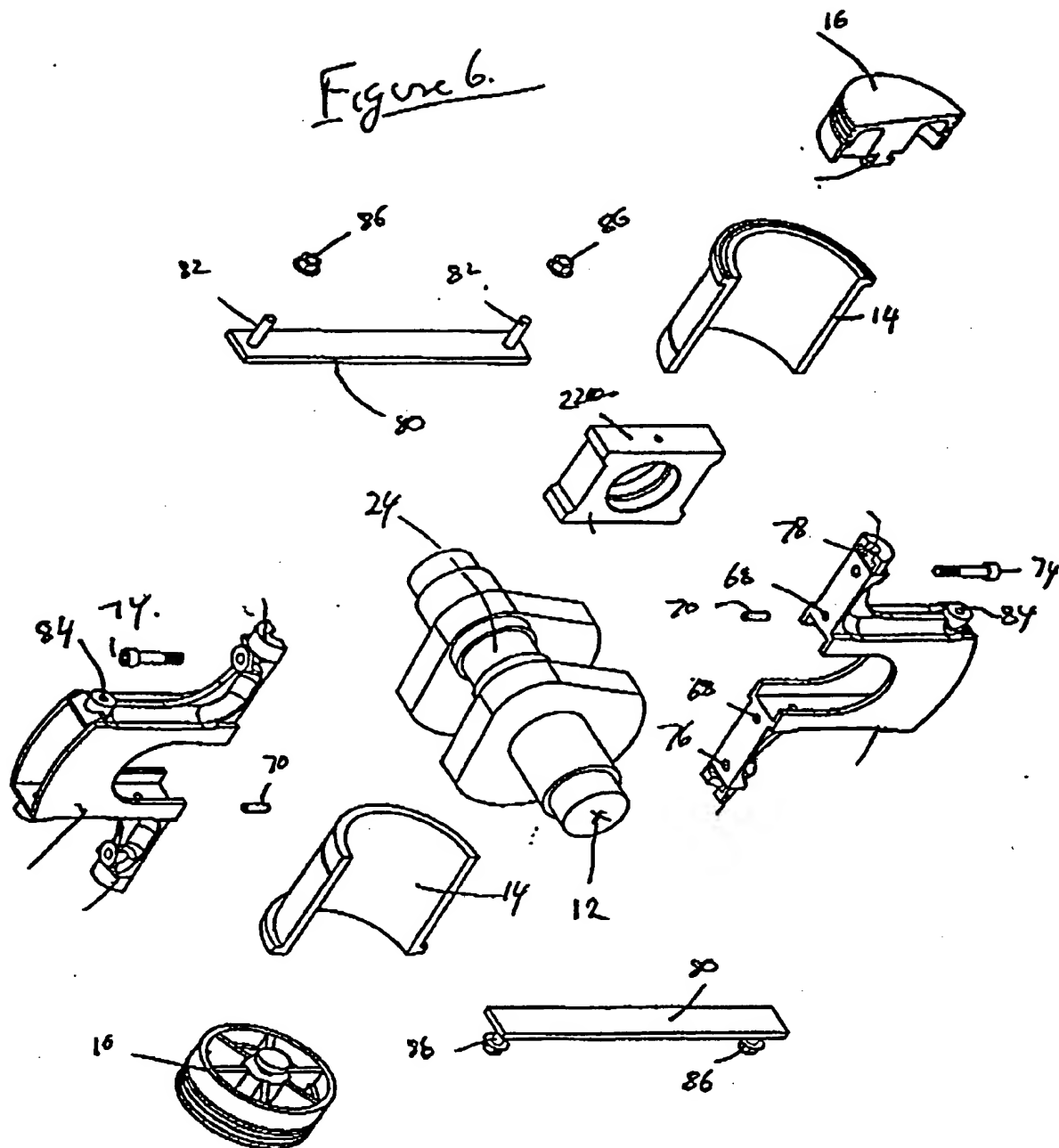
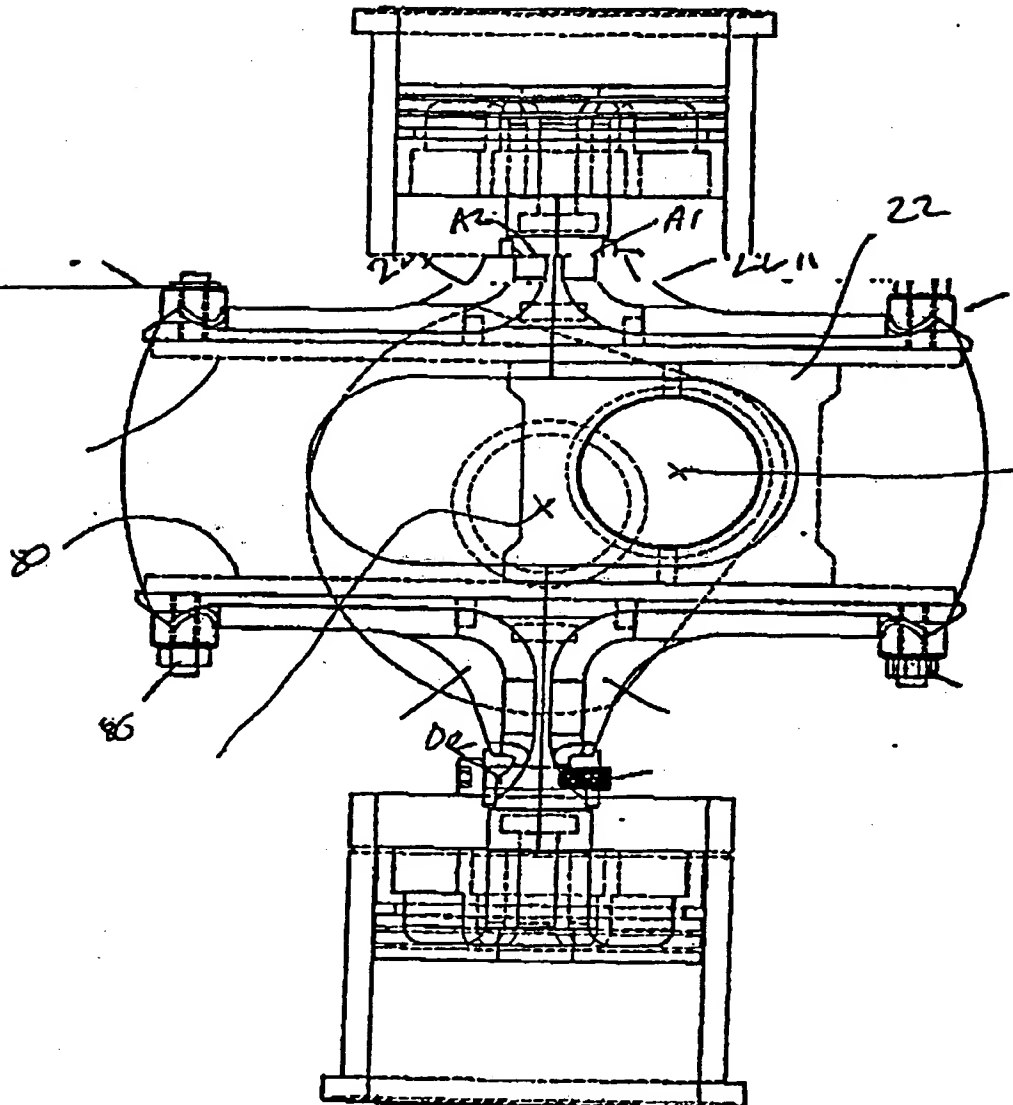


Figure 7



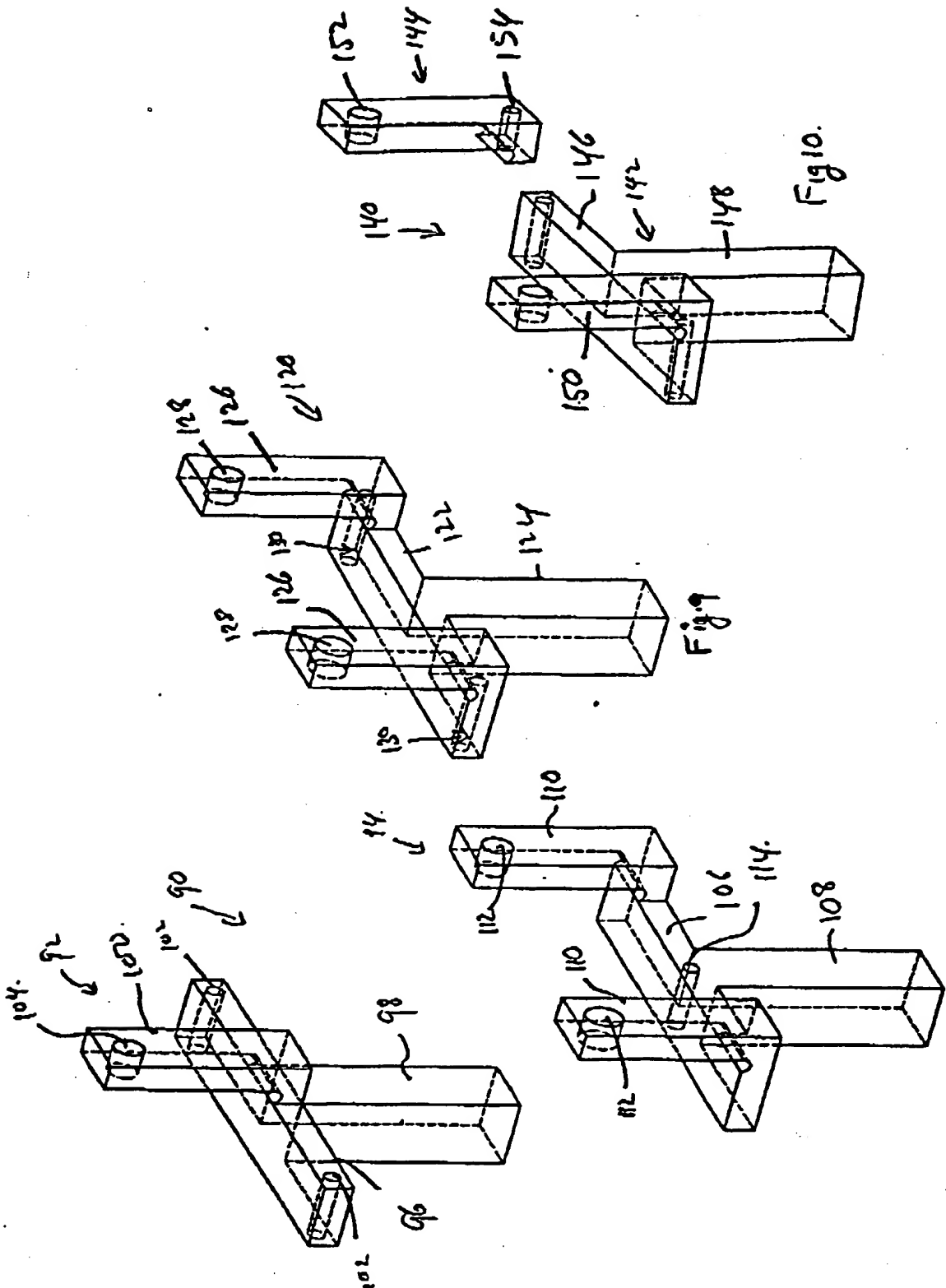
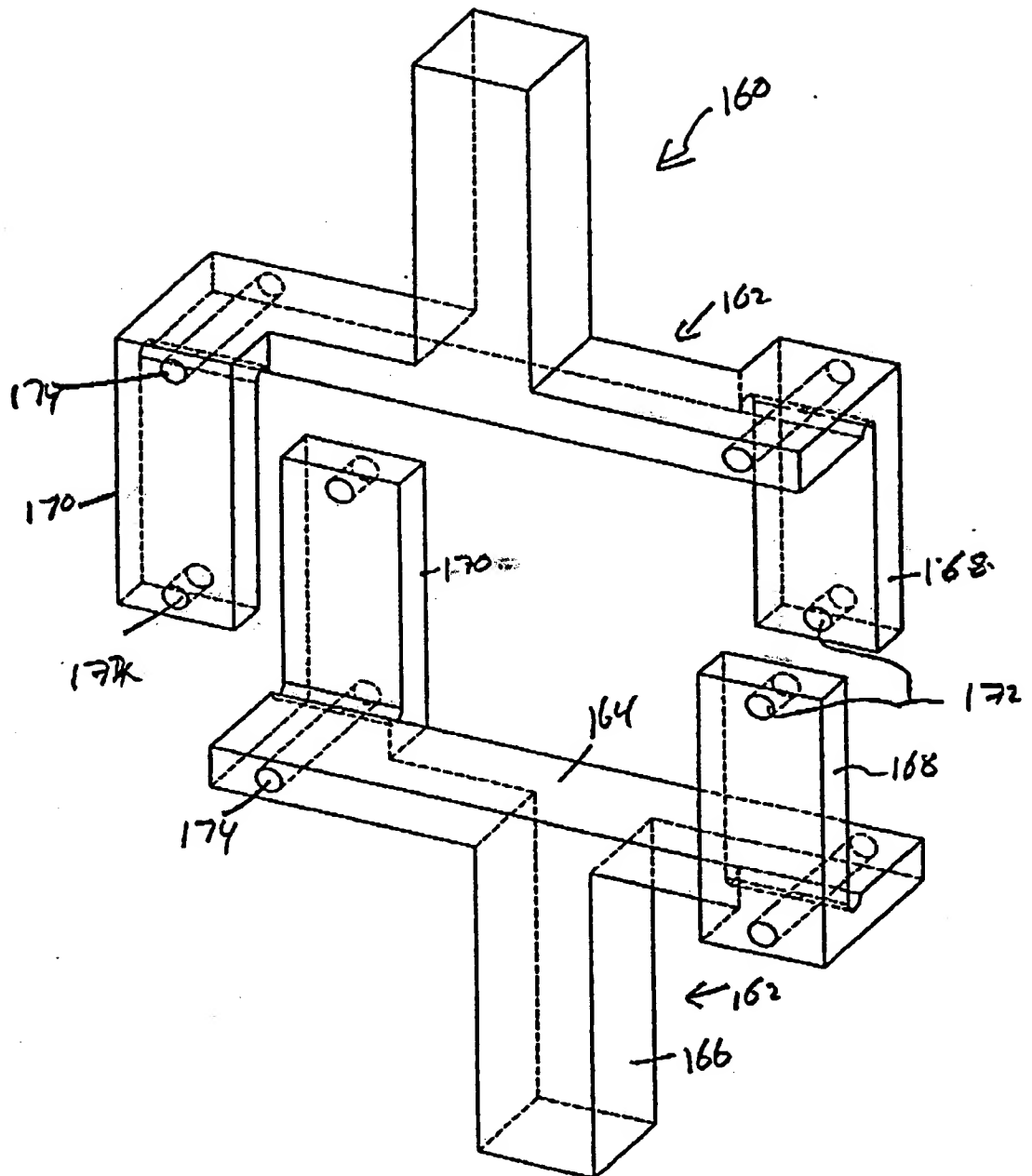


Fig. 8

Fig. 9

Fig. 10

Fig 11